Remarks

For the Claims:

Applicant originally submitted claims 1-8. A first Office Action, dated 12 May 2004, rejected claims 1-8. A First Amendment, dated 2 August 2004, canceled claim 8, amended claims 1, 3, 5, and 6, added claim 9, and retained claims 2, 4, and 7 as originally submitted. A second Office Action, dated 16 November 2004, rejected claims 1-7 and 9. A second Amendment, dated 1 February 2005, canceled claim 9 and amended claims 1-7. A third, and final, Office Action, dated 9 May 2005, rejected claims 1-7. An Amendment After Final Rejection, dated 20 July 2005, amended claims 1, 3, 5, and 6, retained claims 4 and 7 as previously presented, and canceled claim 2. A fourth, non-final Office Action, dated 11 August 2005, rejected claims 1 and 3-7. An Appeal Brief, dated 29 December 2005, was filed in response to the fourth, non-final Office Action. A Notification of a Non-Compliant Appeal Brief, dated 17 March 2006, alleged that the brief did not contain an evidence appendix and a related proceedings appendix. In response, an Appellant's Amended Brief, dated 20 March 2006, added an Evidence Appendix (Appendix C) specifying no evidence and added a Related Proceedings Appendix (Appendix D) specifying no related proceedings. In response to the Appeal Brief, a fifth, non-final Office Action, dated 16 June 2006, reopened prosecution of the above-identified application and rejects claims 1 and 3-7.

In the 16 June 2006 Office Action, claims 1 and 3-7 were rejected under 35 U.S.C. §112, first and second paragraphs. The Office Action also provided guidance as to particular claim modifications that might be called for and pointed out particular claim language that was deemed objectionable. The 16 June 2006

Office Action did not cite any prior art rejections. An Amendment After Appeal Brief, dated 14 September 2006, amended claims 1 and 6 along the lines suggested in the 16 June 2006 Office Action and retained claims 3-5 and 7 as previously presented. Apparently, the amendments and arguments presented in the 14 September 2006 Amendment were found to be persuasive because in this sixth, and non-final, Office Action no previous rejection has been reiterated.

In response to the Amendment After Appeal Brief, this sixth, non-final Office Action, dated 18 December 2006, maintains the rejection of claims 1 and 3-7. This Response retains claims 1 and 3-7 as previously presented. Applicant respectfully requests reconsideration in view of the following remarks.

Claims 1 and 3-7 are now rejected under 35 U.S.C. §103(a) as being unpatentable over Teran et al., U.S. Patent No. 5,521,814 (hereinafter Teran), in view of Maruyama et al., U.S. Patent No. 5,267,346 (hereinafter Maruyama). Teran teaches of a process optimization and control system that plots inter-relationships between variables to meet an objective and Maruyama teaches of a computer based combination problem processor that solves constrained combination satisfaction problems.

This Office Action alleges that Teran largely teaches the invention of independent claim 1. The Office Action implies that Teran teaches of constructing an effective objective function by citing passages from Teran, but acknowledges that Teran does not explicitly teach of constructing an effective objective function by subtracting the constraint function weighted by a weighting factor from the primary objective function. The Office Action alleges that Maruyama teaches of a computation algorithm that includes subtracting (adding) a predetermined value from (to) an objective function value. The Office Action then concludes that

it would have been obvious to modify Teran to include that constructing an effective objective function includes subtracting the constraint function weighted by a weighting factor from the primary objective function, as suggested by Maruyama. The Office Action asserts that such a combination would allow one to efficiently solve constrained combination satisfaction problems and optimization problems for discrete variables by using to the maximum, failure information obtained up to the current point in processing in subsequent processes.

Applicant respectfully disagrees with the Office Action assessment for the following reasons: 1) the teachings of Teran and Maruyama cannot be combined to yield the invention of claim 1 without the benefit of hindsight reconstruction; 2) a hypothetical combination of Teran and Maruyama would not yield something resembling Applicant's claimed invention, i.e., an effective objective function that mathematically combines a primary objective function and a constraint function; and 3) since neither reference teaches or suggests an effective objective function that includes two functions, it follows that neither reference can teach or suggest weighting one of the functions by a weighting factor. Thus, a proper obviousness evaluation set forth below indicates that Applicant's invention is neither taught nor suggested by the prior art, and is therefore allowable.

The invention of independent claim 1 includes limitations directed toward representing a primary goal of an enterprise by a primary objective function, representing a strategic constraint by a constraint function, and constructing an effective objective function by subtracting said constraint function weighted by a weighting factor from said primary objective function. This effective objective function is then optimized. Thus, the invention of claim 1 involves optimization of a combined

function, the combined function including both a primary objective function and a constraint function.

In contrast, the Teran process control system uses a performance model 12 in conjunction with an economic model 14 to meet either performance or economic objectives (Abstract). Teran expressly teaches that the process model 12 is used to calculate the performance of the process (i.e., the levels of the dependent variables) at current conditions (i.e., current chemical rate). The chemical rate, as the independent variable, is then incremented and predicted levels of the dependent variables are determined at each incremented chemical rate until a maximum allowable rate is reached. The predicted levels of the dependent variables can subsequently be graphed or plotted relative to chemical rate (col. 5, lines 46-65). For non-economic goals, the system determines the plot maximum or minimum to calculate the optimum level of the selected independent variable (current rate) to meet the goal (col. 4, lines 16-19).

Teran further expressly teaches that following calculation of the dependent variables relative to chemical rate, economic analysis may optionally be performed (S7). If economic analysis is to be performed, the economic optimizer calculates the process performance economics for each incremented chemical rate (independent variable) using information from the calculated performance base (the dependent variables associated with the incremented chemical rate). To meet economic goals, economic values are inserted into the system to modify the plots prior to calculating the optimum level of the selected independent variable (col. 4, lines 19-22). Optimization, i.e., minimum or maximum economics, based on the desired economic objective is determined and the chemical rate is adjusted to meet the desired objective (col. 7, lines 31-43). The results of economic analysis can subsequently be graphed or plotted relative to

chemical rate (col. 6, line 57, through col. 7, line 23, and FIGs. 4A-4F).

The Office Action asserts that Teran teaches of constructing an effective objective function, but acknowledges that it is not in the form recited in claim 1. That is, the Office Action recognizes that Teran fails to disclose an effective objective function that includes a constraint function weighted by a weighting factor that is subtracted from the primary objective function.

The Office Action cites col. 1, lines 46-47, and col. 4, lines 28-40, as the alleged teaching of constructing an effective objective function. The passage in col. 1 merely indicates that a weighting function is associated with, and determines the level of, each of the inputs to an input neuron (of a neural network). Presumably, since an independent variable (such at the Teran current chemical rate) is an input, such a weighting would determine the level of the independent variable, not a constraint function as recited in claim 1.

The passage in col. 4 of the Teran reference teaches of a process control system 2 that includes an input section "A" comprising a process 4. Quantitative levels of the system variables of the process 4 are transmitted to a control center 6 in section "A". The control center 6 provides information to personnel at a refinery as to the level or value of the variables of the system. The system variables' levels may be changed by control center 6, and a feedback loop is used between the control center 6 and the process 4 to zero-in the level of the system variable which has been adjusted from the control center 6.

As stated in In re Mullin, Wetherby, and Chevalier, 481 F.2d 1333, 179 U.S.P.Q. 97, 100 (C.C.P.A. 1973):

> It is incumbent upon the Patent Office in the first instance to set forth clearly why it regards a claim to be anticipated, obvious, or otherwise defective. The pertinence of each reference, if not apparent, must be clearly explained.

It is unclear how the cited passages teach or suggest an objective function, a constraint function, or an effective objective function as claimed in claim 1 and taught in Applicant's specification. Indeed, Applicant cannot determine a relationship between the cited passages and the elements of claim 1. Applicant cannot determine such a relationship because modeling and optimization are being performed in the Teran system by a process control computer 10 (utilizing software which includes a process model 12 and an economic optimizer 14) at process control section "C" which is not mentioned in the cited passages. Thus, the cited passages fail to provide a teaching or suggestion of Applicant's claimed elements of representing the strategic constraint by a constraint function and constructing an effective objective function, despite Office Action allegations to the contrary. Accordingly without further analysis, the rejection of claims 1 and 3-7 under 35 U.S.C. §103(a) is improper.

Nevertheless, in order to provide a thorough investigation of the Teran reference, even though not taught by the prior art, Applicant presumes herein that the process model 12 (software executed by the process control computer 10) may be construed as representing Applicant's claimed primary objective function and the economic optimizer 14 (software executed by the process control computer 10) may be construed as representing Applicant's claimed effective objective function. With that non-taught presumption in mind, review of the Teran reference now turns toward whether Teran teaches of constructing an effective

objective function and optimizing the effective objective function.

Optimization in the Teran system entails determining an optimal independent variable (current rate) for which each dependent variable meets a particular goal. Teran provides certain exemplary goals in col. 6, lines 42-52. These goals may be to maximize the Research Octane Number (RON), maximize the Alky Make, or minimize acid consumption. When economic analysis is involved, optimization goals may be to find the independent variable (current rate) that maximizes the dollar value of the product produced less the costs involved in producing the product (col. 7, lines 10-15) in response to the dependent variables (RON, Alky Make, acid consumption, etc.).

Applicant defines the term "effective objective function" in the specification in at least paragraph [0032] as being constructed by combining the primary objective function with the strategic objectives, each being multiplied by a weighting factor. Construction of effective objective function enables a user to combine optimization of a selected primary goal of an enterprise, represented by a primary objective function, with strategic constraints of the enterprise, represented by the constraint function. This specific construction of the effective objective function, combining the primary objective function and the constraint function, is recited in claim 1. As stated in In re Zletz, 893 F.2d 319, 13 USPQ2d 1330 (Fed. Cir. 1989):

> When the specification states the meaning that a term in the claim is intended to have, the claim is examined using that meaning, in order to achieve a complete exploration of the applicant's invention and its relation to the prior art.

As discussed above, the meaning that the term "effective objective function" is intended to have is clearly set forth in Applicant's specification, as a mathematical combination of both the primary objective function and the constraint function. Accordingly, the term "effective objective function" and its intended meaning cannot be disregarded. That is, Applicant's claims are to be examined using the meaning set forth in the specification in order to fully appreciate Applicant's invention and explore its relation to the prior art.

Furthermore, the issue is not that Teran teaches of constructing an arbitrarily defined "effective objective function." At issue is whether the prior art references teach or suggest something resembling Applicant's claimed invention of "constructing an effective objective function by subtracting said constraint function weighted by a weighting factor from said primary objective function."

Teran fails to teach or suggest of constructing anything resembling Applicant's claimed effective objective function. Indeed there is no requirement explicitly or implicitly set forth in Teran that relates to construction of an effective objective function.

As to the Maruyama combination problem solver, the passage (i.e., claim 4) cited in the Office Action as the alleged teaching of the features of claim 1 recites means for updating a constraint value to a value obtained by subtracting (adding) a predetermined positive number from (to) an obtained objective function value. Applicant respectfully asserts that Maruyama fails to teach of constructing an effective objective function from two functions, i.e., constructing an effective objective function by subtracting said constraint function weighted by a weighting factor from said objective function.

A number is a quantity or value expressed by a word, symbol, or figure (AskOxford.com, Compact Oxford English Dictionary, Copyright Oxford University Press, 2007), and a positive number is a number that is greater than zero. A value is a numerical quantity that is assigned or is determined by calculation or measurement (MERRIAM-WEBSTER ONLINE (www.Merriam-Webster.com) copyright 2005 by Merriam-Webster, Incorporated). It follows then, that an obtained objective function value is a numerical quantity obtained by calculation of the objective function. Accordingly, the recitation from Maruyama in claim 4 relates to subtracting (adding) a predetermined value greater than one from (to) a numerical quantity obtained by calculation of the objective function to obtain a numerical quantity for updating a constraint numerical quantity. Thus, the Maruyama reference is modifying a first numerical value (i.e., the obtained objective function value) with a second numerical value (i.e., the predetermined positive number) to obtain a third numerical value.

In contrast, a function in the field of mathematics is a relation or expression involving one or more variables (AskOxford.com, Compact Oxford English Dictionary, Copyright Oxford University Press, 2007). Neither a number nor a value is a function in accordance with common definitions of the terms. Consequently, the Maruyama means for updating a constraint value by mathematically combining a predetermined positive number with an obtained objective function value is neither a teaching nor a suggestion of mathematically combining two functions, i.e., a primary objective function and a constraint function, to construct anther function, i.e., the claimed effective objective function.

Well-established patent practice dictates that subject matter which only the inventor teaches cannot be used against its

teacher. As stated in W.L. Gore & Associates, Inc. v. Garlock, Inc., 220 USPQ 303, 312-13 (Fed. Cir. 1983), cert denied, 409 U.S. 851 (1984):

> To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher.

As further stated in In re Wood, 202 USPQ 171, 174 (C.C.P.A. 1979):

> The test for obviousness is not whether the features of one reference may be bodily incorporated into another reference....Rather, we look to see whether combined teachings render the claimed subject matter obvious.

Accordingly, the proper evaluation for determining patentability is to consider whether the prior art suggests the desirability of modifications which make the prior art device more closely resemble Applicant's claimed constructing operation. This suggestion must be found in the prior art and not Applicant's specification. In addition, proper evaluation entails a determination as to whether a hypothetical combination of teachings renders Applicant's claimed constructing operation obvious.

Claim 1 does not merely include a limitation directed toward constructing an effective objective function. Rather, claim 1 includes the limitation of constructing an effective objective function by subtracting the constraint function weighted by a weighting factor from the objective function. As discussed above, the Teran process model and economic optimizer are not a teaching or suggestion of constructing an effective objective function as defined by Applicant. Nor is the Maruyama

mathematical combination of a predetermined positive number with an obtained objective function value to obtain an updated value a teaching of an effective objective function constructed by subtracting the constraint function weighted by a weighting factor from the objective function.

Consequently, even if the Teran and Maruyama teachings are combined as suggested in the Office Action, the resulting combination would not resemble Applicant's claimed invention. That is, Teran and Maruyama cannot teach or suggest in a theoretical combination that which is neither taught nor suggested by either of the references. Rather, the rejection is based on hindsight reconstruction wherein that which Applicant teaches has been used against Applicant. Of course, rejection based on hindsight is improper, thus establishing grounds for reversing the obviousness rejection.

The constructing operation of claim 1 further recites that the constraint function is weighted by a weighting factor. Moreover, the optimizing operation of claim 1 recites optimizing the effective objective function with respect to operational variables over a range of values of the weighting factor for the constraint function.

As discussed above, neither Teran nor Maruyama teach or suggest of combining two functions (i.e., the objective function with the constraint function) to construct an effective objective function. It follows, then, that neither reference can teach or suggest weighting one of the "non-taught" and "non-suggested" functions of a "non-taught" effective objective function with a weighting factor. Since Teran and Maruyama fail to teach or suggest Applicant's claimed weighting factor, it also follows that Teran and Maruyama, alone or in combination, cannot teach or suggest optimizing an effective objective function with respect

to operational (dependent) variables over a range of values of the weighting factor for the constraint function.

Consequently, the combined teachings fail to render the claimed subject matter obvious (In re Wood, supra). Again, such a rejection is based upon the improper use of hindsight reconstruction where only that which the inventor taught is used against its teacher to deprecate Applicant's invention (W.L. Gore & Associates, Inc. v. Garlock, Inc., supra).

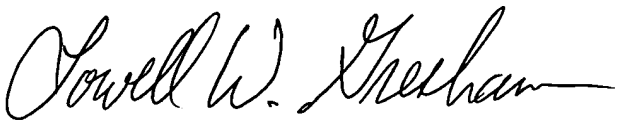
A proper obviousness evaluation indicates that Applicant's invention of claim 1 is neither taught nor suggested by the prior art. Such things which Applicant claims and which are not taught or suggested by the references provide strong grounds for allowance of the claims. Consequently, the Examiner is respectfully requested to reverse the rejection of claim 1.

The Office Action indicates that claims 3-7 are rejected for the same reasoning as applied to claim 1, but does not provide details in the form of specific passages and/or figures that allegedly teach or suggest the features of claims 3-7. Thus, Applicant cannot provide arguments directed toward specific issues presented in an Office Action regarding the allowability of claims 3-7. Nevertheless, claims 3-7 depend directly or indirectly from independent claim 1. Accordingly, claims 3-7 are believed allowable and reconsideration is respectfully requested.

For the reasons set forth above, claims 1 and 3-7 remain in the application as previously submitted and are believed to be allowable.

Applicant believes that the foregoing amendments and remarks are fully responsive to the rejections and/or objections recited in the 18 December 2006 Office Action and that the present application is in a condition for allowance. Accordingly, reconsideration of the present application is respectfully requested.

Respectfully submitted,



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